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10/580,654	05/25/2006	Andrew Kirk	85827105	5323

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EXAMINER
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LEUNG, QUYEN PHAN

ART UNIT	PAPER NUMBER
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2874

MAIL DATE	DELIVERY MODE
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10/31/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/580,654	<b>Applicant(s)</b> KIRK, ANDREW	
	<b>Examiner</b> Quyen P. Leung	<b>Art Unit</b> 2874	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |  |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>20070116</u> . | 6) <input type="checkbox"/> Other: ____  |

## **DETAILED ACTION**

### ***Claim Objections***

Claim 23 is objected to because of the following informalities: the dependency of claim 23 to claim 22 is awkward due to a first waveguide(s) being claimed twice, the first time in claim 22 and the second in claim 23. Likewise, a second waveguide(s) is claimed twice, the first in claim 22 and the second in claim 23. Appropriate correction is required. Claim 23 should depend upon claim 1.

Claim 27 is objected to because of the following informalities: the limitations of the first and second wavelength multiplexer/demultiplexers lack proper antecedent basis. Appropriate correction is required. Claim 27 should depend upon claim 26 instead of claim 25.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-15, 17-18, 28, 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Lin et al (US Patent Publication 2001/0012149). Lin et al discloses the claimed invention.

Re claims 1, 3, 4, 5, Lin et al clearly teaches a wavelength multiplexer/demultiplexer (figure 15a), comprising: a plurality of regions ( holes and dielectric material, see paragraph [0074]) of optically permissive material (photonic crystal) each disposed adjacent one another in a side by side relationship in order to define a stratified body (1502), the material in adjacent regions having differing indexes of refraction (see paragraphs [0098, 0101, 0104]); said stratified body (1502) having a first surface and a second surface that are positioned in a non-parallel relationship with respect to one another, said first surface being a light-receiving surface, and said second surface being a light-exiting surface.

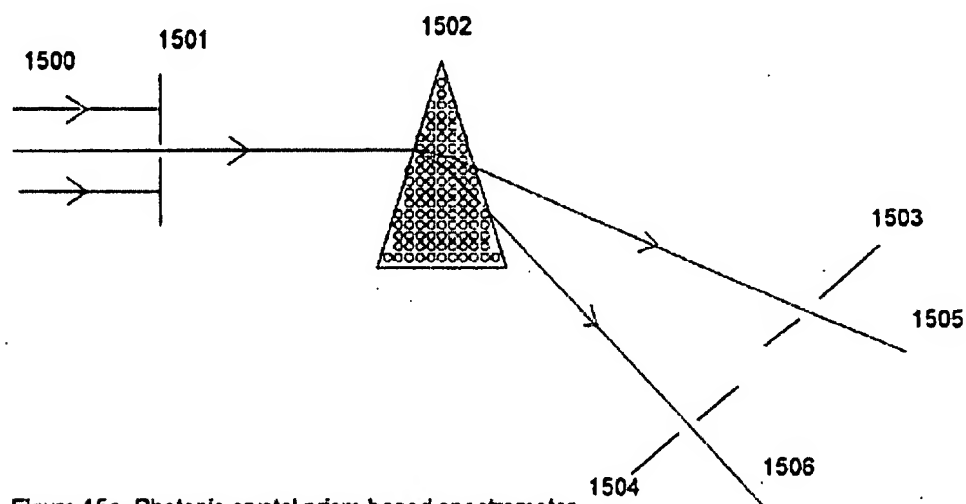


Figure 15a Photonic crystal prism-based spectrometer

[0123] Photonic crystals offer numerous avenues toward implementation of a spectrometer, an apparatus which separates incident light into its spectral components. Several possible implementations are shown in FIG. 15. FIG. 15a shows a prism-based spectrometer in which incident light 1500 is collimated by collimator, 1501, and then is directed onto prism 1502, which comprises optically dispersive photonic crystal. The incident light is thereby split into spectral components 1504 and 1505 which propagate in different directions, and which may be isolated from each other by slits 1503 and 1504 or other suitable devices.

Re claims 2 and 28, see figure 13 in addition to figure 15a above for a wavelength multiplexer/demultiplexer, comprising: a substrate (1302); a plurality of regions (air, 1300) of optically transparent material positioned adjacent one another in a side-by-side relation; adjacent ones of the regions having differing indexes of refraction; each one of the plurality of regions having a respective face contacting the substrate (1302) without contacting an adjacent one of the plurality of regions.

Re claims 6, 15, see figure 15c for the curvilinear light receiving and light exiting surfaces.

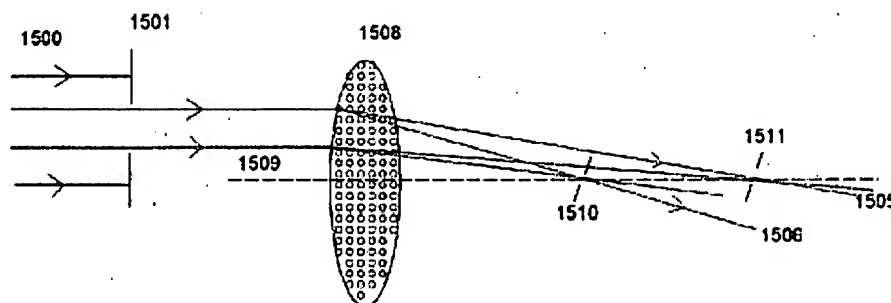


Figure 15c Photonic crystal lens-based spectrometer

Re claims 7-8, note non-solid material (air) and solid material (dielectric).

Re claim 9, see figure 15a above for straight lines as light receiving and light exiting surfaces.

Re claim 10, see figure 15c above for curvilinear lines as light receiving and light exiting surfaces.

Re claims 11-14, see figures 7, 8a, 10b and paragraphs [0059-0060, 0074,0090].

Re claims 17-18, see figure 13 for cladding layer (1301).

Re claim 18, see paragraphs [0117-0118].

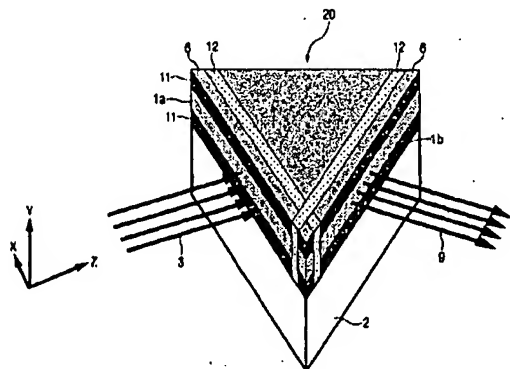
Re claim 29, see figure 15a for a method of separating wavelength component signals from a polychromatic optical signal (1500, inherently polychromatic because paragraph [0123] teaches signal (1500) comprising plural spectral components (1505, 1506)), comprising: providing the polychromatic signal (1500) at an angle of entry to a light-receiving surface of a stratified body (1502) comprising a plurality of regions (holes, dielectric) of optically permissive material (photonic crystal) each disposed adjacent one another in a side by side relationship, the material (photonic crystal, see also paragraphs [0098, 0101, 0104]) in adjacent regions having differing indexes of refraction; capturing (via 1503, 1504 or other suitable devices) the wavelength component signals (1505, 1506) at different respective angles of exit relative to a light-exiting surface of the stratified body (1502).

Claims 1, 4-6, 11-12, 14, 15, 19-20, 22-25, 29 are rejected under 35

U.S.C. 102(b) as being anticipated by Kittaka et al (EP 1 363 145).

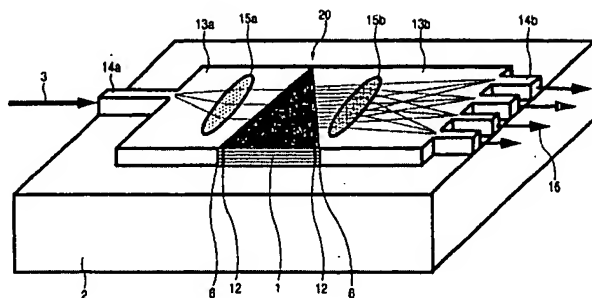
Re claims 1, 4-5, 11-12, 14, Kittaka et al teaches a wavelength multiplexer/demultiplexer (figures 15, 16), comprising: a plurality of regions (11) of optically permissive material (photonic crystal) each disposed adjacent one another in a side by side relationship in order to define a stratified body (20), the material in adjacent regions having differing indexes of refraction (see paragraph [0075] for differing indices of refraction); said stratified body (20) having a first surface (1a) and a second surface (1b) that are positioned in a non-parallel relationship with respect to one another, said first surface being a light-receiving surface, and said second surface being a light-exiting surface.

FIG. 15



[0068] Fig. 15 typically shows an example of the spectroscopic element according to the invention as the above description is collected. Two end surfaces of the one-dimensional photonic crystal 20 shaped like a triangular prism are used as a light input end surface 1a and a light output end surface 1b respectively. Grooves 12 are provided near the input and output end surfaces respectively. Accordingly, parts of the photonic crystal are used as phase gratings (phase modulation units) 6 so that propagation of only specific high-order propagation band light and conversion of the light into a plane wave of output light 9 are performed by the phase gratings 6. Two sides of the propagation portion are surrounded by one-dimensional photonic crystals (multilayer films) 11 different in period or structure from the one-dimensional photonic crystal 20, so that propagation light is confined in the Y-axis direction.

FIG. 16

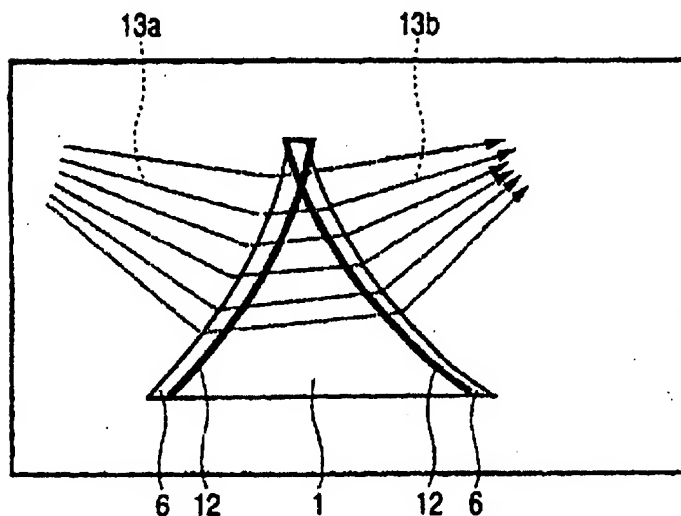


[0083] Fig. 16 is a typical view of a demultiplexing element as an applied example of the invention. Input light (incident light flux) 3 containing an optical signal with a plurality of wavelengths is introduced from a first linear optical waveguide 14a formed on a substrate 2 to a slab optical waveguide 13a. In the structure shown in Fig. 16, it is practical that an optical fiber or the like is connected to a start end of the linear optical waveguide 14a. Alternatively, an optical fiber or the like may be directly connected to an end surface to the slab optical waveguide 13a. Because the optical signal spreads planarly in the slab optical waveguide 13a, the optical signal is converted into nearly parallel light flux by a convex lens portion 15a provided in the slab optical waveguide. When, for example, a part of the slab optical waveguide 13a is replaced by a material having a higher refractive index, the convex lens portion 15a can be achieved. The same condensing effect can be also obtained when a material having a lower refractive index is formed into a concave lens shape.



Re claim 6, 15, see figure 17 for the curvilinear surfaces.

FIG. 17



Re claims 19-20, 24-25, see figure 16 for the first and second collimating structure (15a,15b) and a substrate (2).

Re claims 22, 24-25, figure 16 for input first waveguide (14a) and output second waveguides (14b).

Re claim 23, see paragraph [0086] for the input waveguides (14b) and the output waveguide (14a).

Re claim 29, see figures 15, 16 for the inherent method of separating wavelength component signals from a polychromatic optical signal, comprising: providing the polychromatic signal (3) at an angle of entry to a light-receiving surface (1a) of a stratified body (20) comprising a plurality of regions (multilayer films) of optically

permissive material (photonic crystal) each disposed adjacent one another in a side by side relationship, the material in adjacent regions having differing indexes of refraction; capturing (via 14b) the wavelength component signals at different respective angles of exit relative to a light-exiting surface (1b) of the stratified body (20).

Claims 1, 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Lin et al (Optics Letters 11/1996 article). Lin et al discloses the claimed invention. See page 1771, the first paragraph in the right column which teaches photonic bandgap highly dispersive prisms of the size 15 to 20 microns for light about 700 nm in wavelength and page 1773, the paragraph bridging the left- and right-hand columns. Lin et al teaches the lattice constant of about 300 nm while the light wavelength is 700 nm.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 21, 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kittaka et al. Kittaka et al has been discussed above except for re claim 21 a mirror assembly instead of the convex lenses (15a,15b) as the collimating structure; re claims

26-27 a polarization filter connected to two wavelength multiplexer/demultiplexers of claim 21.

Re claim 21, mirror assemblies, especially parabolic or curved ones, are well-known for collimating light. It would have been an obvious choice of design to one of ordinary skill in the art to substitute the lens assembly (15a,15b) of Kittaka et al by employing the well-known mirror assembly for achieving the net result of collimating light.

Re claims 26-27 lacking any stated criticality it would have been obvious choice of design to one of ordinary skill in the art to employ a polarization filter connected to the two wavelength multiplexer/demultiplexers of claim 21.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pellicori et al (4,957,371) teaches a wedge-filter spectrometer. Ishida et al (JP 61248006, JP 61248007) teaches an optical demultiplexer. Unger (EP 73310) teaches a wavelength multiplexer or demultiplexer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quyen P. Leung whose telephone number is (571) 272-8188. The examiner can normally be reached on normally M-F, 6:15 am - 2:45 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Quyen Leung/  
Quyen Leung  
Primary Patent Examiner  
Group Art Unit 2874

qpl